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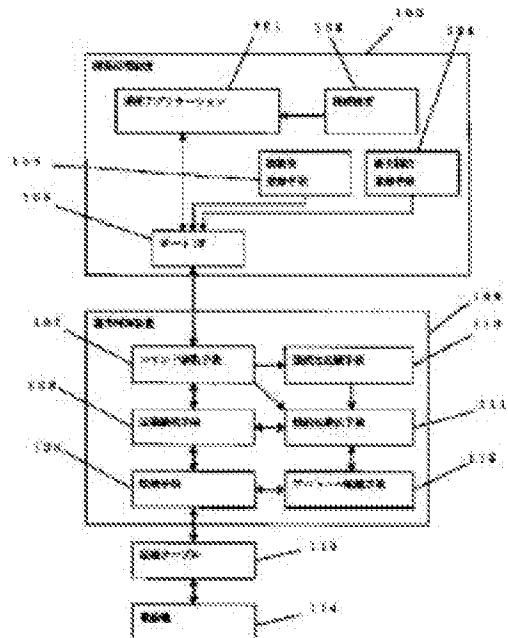
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## (54) WIRELESS COMMUNICATION SYSTEM

(57) Abstract:

**PROBLEM TO BE SOLVED:** To provide a wireless communication system with excellent user-friendliness that requires no revision for connection setting even when a type of a telephone set is changed or a plurality of protocols is available.

**SOLUTION:** In the wireless communication system, a protocol recognition means 112 recognizes a protocol type available in a telephone set 114 and a connection destination selection means 111 automatically decides a proper connection destination in response to the type of the available protocols among connection destinations stored in a connection destination storage means 110, then channel connection is made without the need for changing a connection setting 102 of an information processing unit 100 and the wireless communication system with excellent user-friendliness can be realized.



## **DETAILED DESCRIPTION**

#### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the radio communications system which

performs data communications using radio.

[0002]

[Description of the Prior Art]In recent years, data communications are performed among other information processors, such as a host computer, using the radio communications system which connected a portable telephone, a PHS telephone set, etc. with information processors, such as a personal computer, via communication control units, such as a mobile phone adaptor.

[0003]A data communication protocol which is different from the conventional analog modem in the communication which generally uses a portable telephone and a PHS telephone set is used, . [ whether communication through the protocol conversion device which changes the communications protocol corresponding to each telephone into the protocol of an analog modem for connecting with a host computer is performed, and ] It is communicating by the host computer side by connecting the device which can interpret the communications protocol corresponding to each telephone directly.

[0004]When it enables it to interpret two or more protocols with a host computer, The telephone numbers etc. of the circuit which an information processor connects with a host computer may differ, In such a case, each connection setting information which changed the connection destination telephone number etc. according to each protocol was prepared for the information processor, and the user of the information processor had connected by accepting necessity, and choosing or changing connection setting information.

[0005]Operation of the conventional radio communications system shown in drawing 9 below is explained.

[0006]When connection with two or more connection destinations is assumed, two or more connections sets about each connection destination are beforehand prepared for the information processor 900 like the connections set A902, the connections set B903, and the connections set C904, for example, the connections set A902 -- "PIAFS 32K bps" -- the connections set of business, and the connections set B903 -- "a PDC line switching" -- the connections set of business, and the connections set C904 -- "a PDC packet" -- it is a connections set of business.

[0007]A user chooses a suitable thing out of two or more connections sets according to the kind of telephone 911 which preceded starting communications processing and was connected. For example, in the case of the digital cellular phone which is not packet correspondence, telephone chooses the connections set B903.

[0008]The communication application 901 acquires the telephone number and protocol type of a connection destination from the connections set B903 chosen, and performs a line connection request to the communication control unit 906 via port I/F905.

[0009]The command interpret means 907 interprets the demand from the information processor 900, and carries out a line connection request to the line connecting means 908.

[0010]The line connecting means 908 performs line connection operation according to the demand from the command interpret means 907, and notifies a "success" or "failure" to the communication application 901 via the command interpret means 907 and port I/F905.

[0011]The communication application 901 will start communications processing, if a "success"

is notified.

[0012]

[Problem(s) to be Solved by the Invention]However, in the radio communications system using the above-mentioned conventional communication control unit, For example, when the user who owns both the portable telephone and the PHS telephone set starts radio, while choosing the telephone connected in consideration of available situations, such as radio field intensity of each telephone, The work of changing according to the telephone which connected the connections set of the information processor was needed, and it was user-unfriendly.

[0013]

[Means for Solving the Problem]In order to solve an aforementioned problem, a radio communications system of this invention was constituted so that a kind and capability of telephone connected to a communication control unit might be detected automatically and a connection destination and a connection protocol might be automatically chosen according to a communications protocol which can be used.

[0014]According to a kind and a communications protocol available now of telephone used by this composition even if a user of an information processor does not change connection setting information of an information processor, it is connectable with a suitable connection destination and a communications protocol.

[0015]

[Embodiment of the Invention]The communication control unit of this invention according to claim 1 recognizes the protocol type which a protocol recognition means can use by the telephone connected to the connecting means, Since a connection destination selecting means chooses a suitable connection destination out of the connection destination information memorized by the connection destination memory measure and a line control means performs line connection operation to the selected connection destination according to the result, according to the capability of the telephone connected to the communication control unit, a connection destination can be determined automatically.

[0016]When a connection destination selecting means chooses a connection destination from the connection destination information memorized by the connection destination memory measure, the communication control unit of this invention according to claim 2, A connection destination can be chosen by comparing the protocol type of the connection destination information remembered to be an available protocol type by telephone one by one.

[0017]The communication control unit of this invention according to claim 3 can be chosen from the connection destination information stored in the connection destination memory measure classified by kind which is equivalent to an available protocol type by telephone when a connection destination selecting means chooses a connection destination from the connection destination information memorized by the connection destination memory measure.

[0018]The communication control unit of this invention according to claim 4 chooses the first connection destination information whose protocol type corresponded.

[0019]The communication control unit of this invention according to claim 5 can choose two or

more connection destinations whose protocol types corresponded, and when the connecting operation to one connection destination goes wrong, it can perform connecting operation to the next connection destination automatically.

[0020]The communication control unit of this invention according to claim 6 can choose a connection destination according to the priority decided beforehand, when telephone with two or more available protocol types is connected.

[0021]The communication control unit of this invention according to claim 7 can change the priority of a protocol type to an information processor freely.

[0022]The communication control unit of this invention according to claim 8 is connectable also with different arbitrary connection destinations from the connection destination which the connection destination selecting means chose.

[0023]Hereafter, the radio communications system which shows drawing 8 an embodiment of the invention from drawing 1 is used for an example, and is explained in detail.

[0024](Embodiment 1) Drawing 1 is a lineblock diagram of the radio communications system concerning the embodiment of the invention 1.

[0025]In drawing 1, the information processor 100 is connected with the communication control unit 106 via port I/F105.

[0026]The communication application 101 acquires the information about wireless communication connection from the connections set 102, and performs a line connection request to the communication control unit 106 via port I/F105.

[0027]In addition to the telephone number of a connection destination, user ID, and a password, the information on the communications protocol about wireless communication connection, such as "PIAFS 32K bps" and a "PDC packet", is also stored in the connections set 102.

[0028]The connection destination registration means 103 holds the information about the connection destination for every protocol type in the combination of a connection destination telephone number and a protocol type, as shown in drawing 2, and it registers connection destination information into the communication control unit 106 via port I/F105.

[0029]The priority registration means 104 holds the priority at the time of protocol selection, and registers a protocol selection priority into the communication control unit 106 via port I/F105.

[0030]Port I/F105 performs communication with the communication control unit 106.

[0031]The command interpret means 107 is what has the function to interpret an AT command, The AT+XN command shown in drawing 3 (a) in order to memorize connection destination information to the connection destination memory measure 110, The ATD command shown in drawing 3 (c) the AT+XP command shown in drawing 3 (b) in order to set a protocol selection priority as the connection destination selecting means 111, and in order to perform line connection operation is interpreted, and a line connection request is carried out to the line connecting means 108.

[0032]The line connecting means 108 performs line connection processing to the connection destination which controlled the telephone 114 and was demanded via the connecting means 109 and the connecting cable 113. When "##\*\*" is required, line connection processing is performed

by the pattern beforehand decided as a connection destination, for example, the AT command specification shown by drawing 3 (c), to the connection destination which required "the first connection destination" of the connection destination selecting means 111, and was notified to it. When this processing goes wrong, "the next connection destination" is required from the connection destination selecting means 111, and this is repeated until "he has no connection destination" is reported.

[0033]It is connected with the telephone 114 via the connecting cable 113, and the connecting means 109 recognizes the kind of telephone 114.

[0034]The connection destination memory measure 110 memorizes two or more information related with a connection destination in the group of a connection destination telephone number and a protocol type.

[0035]The connection destination selecting means 111 the connection destination information memorized by the connection destination memory measure 110 by the highest protocol type of the priority of a protocol selection priority in one or more protocol types obtained from the protocol recognition means 112 when "the first connection destination" was required. The connection destination telephone number and protocol type which search in the small order of an index and are included in connection destination information in agreement are notified to the line connecting means 108.

[0036]If "the next connection destination" is required, search of connection destination information will be resumed from the following index searched last time, a connection destination telephone number and a protocol type will be acquired from the connection destination information whose protocol type corresponds next, and it will notify to the line connecting means 108.

[0037]A protocol type with a high priority is chosen next in the protocol type obtained from the protocol recognition means 112 according to the protocol selection priority when the connection destination information whose protocol type corresponds was not able to be discovered, The connection destination information memorized by the connection destination memory measure 110 is again searched in the small order of an index.

[0038]It refers to all available protocol types, and when the connection destination information whose protocol type corresponds is not able to be discovered, it notifies the line connecting means 108 "he has no connection destination."

[0039]The protocol recognition means 112 performs protocol recognition processing according to the kind of telephone 114 obtained from the connecting means 109, and recognizes an available protocol type by the telephone 114 connected.

[0040]Although the communication control unit 106 is controlled by this embodiment with the AT command shown in drawing 3, there are that no you may be an AT command of different specification and command systems other than an AT command also until it says.

[0041]Operation when the telephone 114 which can perform communication of a "PDC line switching" and "PIAFS 32K bps" in the radio communications system constituted as mentioned above is connected is explained below.

[0042]The connection destination registration means 103 generates an AT command sequence as shown in drawing 4 according to the AT command specification shown in drawing 3 (a) from the information about the connection destination currently held, and sends it to the command interpret means 107 via port I/F105.

[0043]The command interpret means 107 will memorize the information about a connection destination to the connection destination memory measure 110 in accordance with the grammar of the AT+XN command shown in drawing 3 (a), if the AT command sequence shown in drawing 4 is received. Information as shown in drawing 5 is memorized by the connection destination memory measure 110.

[0044]The priority registration means 104 generates the AT command shown in drawing 6 according to the AT command specification shown in drawing 3 (b) from the protocol selection priority which the user set up beforehand, and sends it to the command interpret means 107 via port I/F105.

[0045]The command interpret means 107 will set the priority demanded in accordance with the grammar of the AT+XP command shown in drawing 3 (b) as the connection destination selecting means 111, if the AT command shown in drawing 6 is received. For example, in the example of drawing 6, a priority is the highest and a "PDC line switching" has [ "PIAFS 64K bps" ] the lowest priority.

[0046]If the telephone 114 is connected to the communication control unit 106 via the connecting cable 113, the connecting means 109 will recognize the kind of connected telephone, for example, the kind of a digital cellular phone, PHS telephone set, etc.

[0047]An example of a method which recognizes the kind of telephone below is explained.

[0048]Physical and electric I/F which connects the connecting cable 113 with the telephone 114 changes with kinds of telephone. For example, the shape of a connector may differ between a digital cellular phone terminal and a PHS telephone set, and they may differ in connector shape with the career which provides communications service also with the same PHS telephone set. For this reason, the connecting cables 113 differ for every kind of telephone.

[0049]An example of connection of the connecting cable 113 is shown in drawing 7. "The control line n" is connected to the applicable signal wire by the side of the communication control unit 106 from a signal wire required to control telephone from the communication control unit 106, and the "control line 1." The earthed signal wire by the side of telephone is connected to the earthed signal wire by the side of the communication control unit 106. One or more cable recognition signal lines for recognizing the kind of connecting cable 113 are formed in the communication control unit 106 side, and these signal wires are made into grounding or a released condition within the connecting cable 113 according to the kind of connecting cable 113. Pull-up of these cable recognition signal lines is carried out to power supply voltage via the resistor by the connecting means 109. Thereby, the voltage of the signal grounded by connecting cable 113 inside becomes the same as a grounding signal, and if released, it will become the same as power supply voltage.

[0050]The connecting cable 113 and the connecting means 109 are constituted as mentioned

above, and the kind of connecting cable 113 can be recognized by measuring the voltage of the cable recognition signal line formed in the connecting means 109. Since the kinds of connectable telephone 114 differ according to the kind of connecting cable 113, they can recognize the kind of telephone 114.

[0051]Since three cable recognition signal lines are formed in the example of drawing 7, a maximum of eight kinds of telephones can be recognized.

[0052]If the communication application 101 tends to start communication, the AT command sequence shown below in order to connect with a host computer according to the contents of the connections set 102 will be generated, and it will send to the command interpret means 107 via port I/F105.

[0053]The ATD##\*\* command interpret means 107 is required of the line connecting means 108 so that this character string may be interpreted and a line connection may be performed to "##\*\*."

[0054]Since "##\*\*" is specified as a connection destination, the line connecting means 108 requires "the first connection destination" of the connection destination selecting means 111 according to the AT command specification shown in drawing 3 (c).

[0055]The connection destination selecting means 111 will require an available protocol type by the telephone 114 connected to the protocol recognition means 112 now, if "the first connection destination" is required.

[0056]The protocol recognition means 112 acquires the kind of telephone 114 connected from the connecting means 109 according to the demand from the connection destination selecting means 111, and carries out protocol recognition processing for every kind of the.

[0057]An example of the protocol recognition processing for every kind of telephone 114 is explained below.

[0058]An example of a protocol recognition processing sequence is shown in drawing 8 (a). In drawing 8 (a), the protocol recognition means 112 sends out an "attribute request message" to the telephone 114 via the connecting means 109 and the connecting cable 113. The telephone 114 sends out an "attribute notification message" to this message. The information about the kind of data communication protocol which can be used for this message by the connected telephone 114, For example, the information that a "PDC line switching" and a "PDC packet" can be used is stored, and the protocol recognition means 112 interprets the information about the kind of these data communication protocols, and considers it as an available communications protocol classification now.

[0059]Other examples of a protocol recognition processing sequence are shown in drawing 8 (b). In drawing 8 (b), the protocol recognition means 112 waits to send out an "attribute notification message" from the telephone 114 via the connecting means 109 and the connecting cable 113. If an "attribute notification message" is received, an "attribute notification message" will be returned and protocol recognition processing will be ended. The information available by the telephone 114 connected to the "attribute notification message" about the kind of data communication protocol, For example, the information that "PIAFS 32K bps" and "PIAFS 64K

bps" can be used is stored, and the protocol recognition means 112 interprets the information about the kind of these data communication protocols, and considers it as an available communications protocol classification now.

[0060]Protocol recognition processing which was described above can judge an available protocol type by the telephone 114 connected now by performing protocol recognition processing by a sequence which changed with kinds of telephone and is different according to the kind of telephone 114 obtained from the connecting means 109.

[0061]The protocol recognition means 112 carries out the above-mentioned protocol recognition processing, and acquires a "PDC line switching" and "PIAFS 32K bps" as an available protocol type by the telephone 114 connected now.

[0062]The connection destination selecting means 111 retrieves the connection destination information stored in the connection destination memory measure 110 according to the protocol selection priority in the acquired protocol type, highest protocol type, i.e., "PIAFS 32K bps", of the priority. In the example of drawing 5, the connection destination information on the index number 2 is discovered.

[0063]A connection destination selecting means notifies "123-2222-2222" and "PIAFS 32K bps" to the line connecting means 108 in the example of the connection destination telephone number contained in the discovered connection destination information, and a protocol type, i.e., drawing 5.

[0064]The line connecting means 108 tries a line connection by the connection destination telephone number and protocol type which were notified from the protocol selecting means 111.

[0065]If the line connecting means 108 succeeds in a line connection, it will notify the completion of connection to the communication application 101 via the command interpret means 107 and port I/F105, and communications processing is started.

[0066]If the line connecting means 108 fails in a line connection, "the next connection destination" will be required from the connection destination selecting means 111.

[0067]If "the next connection destination" is required, the connection destination selecting means 111 will resume retrieval processing, the following connection destination information 3, i.e., index number, to which it referred as the point, will try search of another connection destination information on the same communications protocol, will discover the connection destination information on the index number 5, and will notify it to the line connecting means 108.

[0068]The line connecting means 108 tries a line connection again according to the connection destination telephone number and protocol type which were notified.

[0069]If the line connecting means 108 fails also in the line connection to this connection destination telephone number, it will require "the next connection destination" from the connection destination selecting means 111 again.

[0070]Although the connection destination selecting means 111 resumes retrieval processing, the following connection destination information 6, i.e., index, which searched like the point, Since the connection destination information applicable to the connection destination memory measure 110 cannot be discovered, search is again started from the index number 1 now, the next protocol

type, i.e., a "PDC line switching", of a priority of an available protocol type, and the connection destination information on the index number 3 is discovered.

[0071]It searches like the following and a line connection is tried one by one by the applicable connection destination.

[0072]The connection destination selecting means 111 notifies "search failure" to the line connecting means 108, when it refers to the lowest-priority protocol type and search results cannot be obtained.

[0073]In this case, the line connecting means 108 notifies "connection failure" to the communication application 101 via the command interpret means 107 and port I/F105.

[0074]Thus, even if it is a case where the kind of telephone to connect is changed, and a case where the telephone which can use two or more communications protocols is connected according to this embodiment, It is not necessary to change the connections set of an information processor, and since a connection destination can be automatically determined according to the priority which the user etc. decided beforehand, the radio communications system which does not need the change operating of a connection destination is realizable.

[0075]

[Effect of the Invention]Since a connection destination and a protocol are automatically chosen according to the connected telephone according to this invention as explained in full detail above, it is not necessary to change the connections set of an information processor according to a situation, and a radio communications system with easy operation can be realized.

## CLAIMS

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[Claim(s)]

[Claim 1]A communication control unit which connects with an information processor, controls telephone according to a demand from this information processor, and communicates with other information processors, comprising:

A connecting means which can connect telephone by which communications protocols differ.

A protocol recognition means to recognize a protocol type which can be used by telephone connected to said connecting means.

A connection destination memory measure which memorizes two or more connection destination information.

A connection destination selecting means which chooses a connection destination from two or more connection destination information memorized by said connection destination memory measure according to a protocol type which can be used by telephone connected to said connecting means recognized by said protocol recognition means, A line control means which performs connecting operation of a communication line to a connection destination which said connection destination selecting means chose according to a demand from said information processor using telephone connected to said connecting means.

[Claim 2]The communication control unit according to claim 1, wherein connection destination information memorized by connection destination memory measure comprises a connection destination telephone number and a protocol type.

[Claim 3]The communication control unit according to claim 1 which a connection destination memory measure comprises two or more connection destination memory measures classified by kind classified for every protocol type, and carries out that one or more connection destination telephone numbers are memorized to a connection destination memory measure classified by kind with the feature.

[Claim 4]The communication control unit according to claim 2, wherein a connection destination selecting means compares a protocol type included in connection destination information memorized by a protocol type recognized by a protocol recognition means, and connection destination memory measure and chooses a connection destination according to the first congruous connection destination information.

[Claim 5]A connection destination selecting means compares a kind of telephone contained in connection destination information memorized by a kind and a connection destination memory measure of telephone recognized by a telephone recognition means, The communication control unit according to claim 2 or 3, wherein it chooses a connection destination according to all the congruous connection destination information, and a line control means tries connecting operation in order until connection is successful to one or more connection destinations which a connection destination selecting means chose.

[Claim 6]The communication control unit according to claim 4 or 5 when two or more protocol types are available with telephone connected to a connecting means, wherein a connection destination selecting means chooses a connection destination according to a priority decided beforehand.

[Claim 7]The communication control unit according to claim 6 being able to set up a priority which chooses a connection destination from an information processor.

[Claim 8]The communication control unit according to claim 6 or 7 determining whether to connect a line control means to a connection destination which a connection destination selecting means chose according to directions of an information processor, or connect with a connection destination to which an information processor pointed.

[Claim 9]An information processor having a connection destination registration means to connect with a communication control unit and to perform radio and to be an information processor and to register connection destination information into said communication control unit.

[Claim 10]The information processor according to claim 9 having a priority registration means to register a priority of a protocol type into a communication control unit.

## **TECHNICAL FIELD**

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[Field of the Invention]This invention relates to the radio communications system which performs data communications using radio.

## PRIOR ART

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[Description of the Prior Art] In recent years, data communications are performed among other information processors, such as a host computer, using the radio communications system which connected a portable telephone, a PHS telephone set, etc. with information processors, such as a personal computer, via communication control units, such as a mobile phone adaptor.

[0003] A data communication protocol which is different from the conventional analog modem in the communication which generally uses a portable telephone and a PHS telephone set is used, . [ whether communication through the protocol conversion device which changes the communications protocol corresponding to each telephone into the protocol of an analog modem for connecting with a host computer is performed, and ] It is communicating by the host computer side by connecting the device which can interpret the communications protocol corresponding to each telephone directly.

[0004] When it enables it to interpret two or more protocols with a host computer, The telephone numbers etc. of the circuit which an information processor connects with a host computer may differ, In such a case, each connection setting information which changed the connection destination telephone number etc. according to each protocol was prepared for the information processor, and the user of the information processor had connected by accepting necessity, and choosing or changing connection setting information.

[0005] Operation of the conventional radio communications system shown in drawing 9 below is explained.

[0006] When connection with two or more connection destinations is assumed, two or more connections sets about each connection destination are beforehand prepared for the information processor 900 like the connections set A902, the connections set B903, and the connections set C904. for example, the connections set A902 -- "PIAFS 32K bps" -- the connections set of business, and the connections set B903 -- "a PDC line switching" -- the connections set of business, and the connections set C904 -- "a PDC packet" -- it is a connections set of business.

[0007] A user chooses a suitable thing out of two or more connections sets according to the kind of telephone 911 which preceded starting communications processing and was connected. For example, in the case of the digital cellular phone which is not packet correspondence, telephone chooses the connections set B903.

[0008] The communication application 901 acquires the telephone number and protocol type of a connection destination from the connections set B903 chosen, and performs a line connection request to the communication control unit 906 via port I/F905.

[0009] The command interpret means 907 interprets the demand from the information processor 900, and carries out a line connection request to the line connecting means 908.

[0010] The line connecting means 908 performs line connection operation according to the demand from the command interpret means 907, and notifies a "success" or "failure" to the communication application 901 via the command interpret means 907 and port I/F905.

[0011] The communication application 901 will start communications processing, if a "success"

is notified.

## **EFFECT OF THE INVENTION**

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[Effect of the Invention] Since a connection destination and a protocol are automatically chosen according to the connected telephone according to this invention as explained in full detail above, it is not necessary to change the connections set of an information processor according to a situation, and a radio communications system with easy operation can be realized.

## **TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] However, in the radio communications system using the above-mentioned conventional communication control unit, For example, when the user who owns both the portable telephone and the PHS telephone set starts radio, while choosing the telephone connected in consideration of available situations, such as radio field intensity of each telephone, The work of changing according to the telephone which connected the connections set of the information processor was needed, and it was user-unfriendly.

## **MEANS**

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[Means for Solving the Problem] In order to solve an aforementioned problem, a radio communications system of this invention was constituted so that a kind and capability of telephone connected to a communication control unit might be detected automatically and a connection destination and a connection protocol might be automatically chosen according to a communications protocol which can be used.

[0014] According to a kind and a communications protocol available now of telephone used by this composition even if a user of an information processor does not change connection setting information of an information processor, it is connectable with a suitable connection destination and a communications protocol.

[0015]

[Embodiment of the Invention] The communication control unit of this invention according to claim 1 recognizes the protocol type which a protocol recognition means can use by the telephone connected to the connecting means, Since a connection destination selecting means chooses a suitable connection destination out of the connection destination information memorized by the connection destination memory measure and a line control means performs line connection operation to the selected connection destination according to the result, according to the capability of the telephone connected to the communication control unit, a connection destination can be determined automatically.

[0016] When a connection destination selecting means chooses a connection destination from the connection destination information memorized by the connection destination memory measure,

the communication control unit of this invention according to claim 2, A connection destination can be chosen by comparing the protocol type of the connection destination information remembered to be an available protocol type by telephone one by one.

[0017]The communication control unit of this invention according to claim 3 can be chosen from the connection destination information stored in the connection destination memory measure classified by kind which is equivalent to an available protocol type by telephone when a connection destination selecting means chooses a connection destination from the connection destination information memorized by the connection destination memory measure.

[0018]The communication control unit of this invention according to claim 4 chooses the first connection destination information whose protocol type corresponded.

[0019]The communication control unit of this invention according to claim 5 can choose two or more connection destinations whose protocol types corresponded, and when the connecting operation to one connection destination goes wrong, it can perform connecting operation to the next connection destination automatically.

[0020]The communication control unit of this invention according to claim 6 can choose a connection destination according to the priority decided beforehand, when telephone with two or more available protocol types is connected.

[0021]The communication control unit of this invention according to claim 7 can change the priority of a protocol type to an information processor freely.

[0022]The communication control unit of this invention according to claim 8 is connectable also with different arbitrary connection destinations from the connection destination which the connection destination selecting means chose.

[0023]Hereafter, the radio communications system which shows drawing 8 an embodiment of the invention from drawing 1 is used for an example, and is explained in detail.

[0024](Embodiment 1) Drawing 1 is a lineblock diagram of the radio communications system concerning the embodiment of the invention 1.

[0025]In drawing 1, the information processor 100 is connected with the communication control unit 106 via port I/F105.

[0026]The communication application 101 acquires the information about wireless communication connection from the connections set 102, and performs a line connection request to the communication control unit 106 via port I/F105.

[0027]In addition to the telephone number of a connection destination, user ID, and a password, the information on the communications protocol about wireless communication connection, such as "PIAFS 32K bps" and a "PDC packet", is also stored in the connections set 102.

[0028]The connection destination registration means 103 holds the information about the connection destination for every protocol type in the combination of a connection destination telephone number and a protocol type, as shown in drawing 2, and it registers connection destination information into the communication control unit 106 via port I/F105.

[0029]The priority registration means 104 holds the priority at the time of protocol selection, and registers a protocol selection priority into the communication control unit 106 via port I/F105.

[0030]Port I/F105 performs communication with the communication control unit 106.

[0031]The command interpret means 107 is what has the function to interpret an AT command, The AT+XN command shown in drawing 3 (a) in order to memorize connection destination information to the connection destination memory measure 110, The ATD command shown in drawing 3 (c) the AT+XP command shown in drawing 3 (b) in order to set a protocol selection priority as the connection destination selecting means 111, and in order to perform line connection operation is interpreted, and a line connection request is carried out to the line connecting means 108.

[0032]The line connecting means 108 performs line connection processing to the connection destination which controlled the telephone 114 and was demanded via the connecting means 109 and the connecting cable 113. When "##\*\*" is required, line connection processing is performed by the pattern beforehand decided as a connection destination, for example, the AT command specification shown by drawing 3 (c), to the connection destination which required "the first connection destination" of the connection destination selecting means 111, and was notified to it. When this processing goes wrong, "the next connection destination" is required from the connection destination selecting means 111, and this is repeated until "he has no connection destination" is reported.

[0033]It is connected with the telephone 114 via the connecting cable 113, and the connecting means 109 recognizes the kind of telephone 114.

[0034]The connection destination memory measure 110 memorizes two or more information related with a connection destination in the group of a connection destination telephone number and a protocol type.

[0035]The connection destination selecting means 111 the connection destination information memorized by the connection destination memory measure 110 by the highest protocol type of the priority of a protocol selection priority in one or more protocol types obtained from the protocol recognition means 112 when "the first connection destination" was required. The connection destination telephone number and protocol type which search in the small order of an index and are included in connection destination information in agreement are notified to the line connecting means 108.

[0036]If "the next connection destination" is required, search of connection destination information will be resumed from the following index searched last time, a connection destination telephone number and a protocol type will be acquired from the connection destination information whose protocol type corresponds next, and it will notify to the line connecting means 108.

[0037]A protocol type with a high priority is chosen next in the protocol type obtained from the protocol recognition means 112 according to the protocol selection priority when the connection destination information whose protocol type corresponds was not able to be discovered, The connection destination information memorized by the connection destination memory measure 110 is again searched in the small order of an index.

[0038]It refers to all available protocol types, and when the connection destination information

whose protocol type corresponds is not able to be discovered, it notifies the line connecting means 108 "he has no connection destination."

[0039]The protocol recognition means 112 performs protocol recognition processing according to the kind of telephone 114 obtained from the connecting means 109, and recognizes an available protocol type by the telephone 114 connected.

[0040]Although the communication control unit 106 is controlled by this embodiment with the AT command shown in drawing 3, there are that no you may be an AT command of different specification and command systems other than an AT command also until it says.

[0041]Operation when the telephone 114 which can perform communication of a "PDC line switching" and "PIAFS 32K bps" in the radio communications system constituted as mentioned above is connected is explained below.

[0042]The connection destination registration means 103 generates an AT command sequence as shown in drawing 4 according to the AT command specification shown in drawing 3 (a) from the information about the connection destination currently held, and sends it to the command interpret means 107 via port I/F105.

[0043]The command interpret means 107 will memorize the information about a connection destination to the connection destination memory measure 110 in accordance with the grammar of the AT+XN command shown in drawing 3 (a), if the AT command sequence shown in drawing 4 is received. Information as shown in drawing 5 is memorized by the connection destination memory measure 110.

[0044]The priority registration means 104 generates the AT command shown in drawing 6 according to the AT command specification shown in drawing 3 (b) from the protocol selection priority which the user set up beforehand, and sends it to the command interpret means 107 via port I/F105.

[0045]The command interpret means 107 will set the priority demanded in accordance with the grammar of the AT+XP command shown in drawing 3 (b) as the connection destination selecting means 111, if the AT command shown in drawing 6 is received. For example, in the example of drawing 6, a priority is the highest and a "PDC line switching" has [ "PIAFS 64K bps" ] the lowest priority.

[0046]If the telephone 114 is connected to the communication control unit 106 via the connecting cable 113, the connecting means 109 will recognize the kind of connected telephone, for example, the kind of a digital cellular phone, PHS telephone set, etc.

[0047]An example of a method which recognizes the kind of telephone below is explained.

[0048]Physical and electric I/F which connects the connecting cable 113 with the telephone 114 changes with kinds of telephone. For example, the shape of a connector may differ between a digital cellular phone terminal and a PHS telephone set, and they may differ in connector shape with the career which provides communications service also with the same PHS telephone set. For this reason, the connecting cables 113 differ for every kind of telephone.

[0049]An example of connection of the connecting cable 113 is shown in drawing 7. "The control line n" is connected to the applicable signal wire by the side of the communication

control unit 106 from a signal wire required to control telephone from the communication control unit 106, and the "control line 1." The earthed signal wire by the side of telephone is connected to the earthed signal wire by the side of the communication control unit 106. One or more cable recognition signal lines for recognizing the kind of connecting cable 113 are formed in the communication control unit 106 side, and these signal wires are made into grounding or a released condition within the connecting cable 113 according to the kind of connecting cable 113. Pull-up of these cable recognition signal lines is carried out to power supply voltage via the resistor by the connecting means 109. Thereby, the voltage of the signal grounded by connecting cable 113 inside becomes the same as a grounding signal, and if released, it will become the same as power supply voltage.

[0050]The connecting cable 113 and the connecting means 109 are constituted as mentioned above, and the kind of connecting cable 113 can be recognized by measuring the voltage of the cable recognition signal line formed in the connecting means 109. Since the kinds of connectable telephone 114 differ according to the kind of connecting cable 113, they can recognize the kind of telephone 114.

[0051]Since three cable recognition signal lines are formed in the example of drawing 7, a maximum of eight kinds of telephones can be recognized.

[0052]If the communication application 101 tends to start communication, the AT command sequence shown below in order to connect with a host computer according to the contents of the connections set 102 will be generated, and it will send to the command interpret means 107 via port I/F105.

[0053]The ATD##\*\* command interpret means 107 is required of the line connecting means 108 so that this character string may be interpreted and a line connection may be performed to "#\*\*."

[0054]Since "##\*\*" is specified as a connection destination, the line connecting means 108 requires "the first connection destination" of the connection destination selecting means 111 according to the AT command specification shown in drawing 3 (c).

[0055]The connection destination selecting means 111 will require an available protocol type by the telephone 114 connected to the protocol recognition means 112 now, if "the first connection destination" is required.

[0056]The protocol recognition means 112 acquires the kind of telephone 114 connected from the connecting means 109 according to the demand from the connection destination selecting means 111, and carries out protocol recognition processing for every kind of the.

[0057]An example of the protocol recognition processing for every kind of telephone 114 is explained below.

[0058]An example of a protocol recognition processing sequence is shown in drawing 8 (a). In drawing 8 (a), the protocol recognition means 112 sends out an "attribute request message" to the telephone 114 via the connecting means 109 and the connecting cable 113. The telephone 114 sends out an "attribute notification message" to this message. The information about the kind of data communication protocol which can be used for this message by the connected telephone

114, For example, the information that a "PDC line switching" and a "PDC packet" can be used is stored, and the protocol recognition means 112 interprets the information about the kind of these data communication protocols, and considers it as an available communications protocol classification now.

[0059]Other examples of a protocol recognition processing sequence are shown in drawing 8 (b). In drawing 8 (b), the protocol recognition means 112 waits to send out an "attribute notification message" from the telephone 114 via the connecting means 109 and the connecting cable 113. If an "attribute notification message" is received, an "attribute notification message" will be returned and protocol recognition processing will be ended. The information available by the telephone 114 connected to the "attribute notification message" about the kind of data communication protocol, For example, the information that "PIAFS 32K bps" and "PIAFS 64K bps" can be used is stored, and the protocol recognition means 112 interprets the information about the kind of these data communication protocols, and considers it as an available communications protocol classification now.

[0060]Protocol recognition processing which was described above can judge an available protocol type by the telephone 114 connected now by performing protocol recognition processing by a sequence which changed with kinds of telephone and is different according to the kind of telephone 114 obtained from the connecting means 109.

[0061]The protocol recognition means 112 carries out the above-mentioned protocol recognition processing, and acquires a "PDC line switching" and "PIAFS 32K bps" as an available protocol type by the telephone 114 connected now.

[0062]The connection destination selecting means 111 retrieves the connection destination information stored in the connection destination memory measure 110 according to the protocol selection priority in the acquired protocol type, highest protocol type, i.e., "PIAFS 32K bps", of the priority. In the example of drawing 5, the connection destination information on the index number 2 is discovered.

[0063]A connection destination selecting means notifies "123-2222-2222" and "PIAFS 32K bps" to the line connecting means 108 in the example of the connection destination telephone number contained in the discovered connection destination information, and a protocol type, i.e., drawing 5.

[0064]The line connecting means 108 tries a line connection by the connection destination telephone number and protocol type which were notified from the protocol selecting means 111.

[0065]If the line connecting means 108 succeeds in a line connection, it will notify the completion of connection to the communication application 101 via the command interpret means 107 and port I/F105, and communications processing is started.

[0066]If the line connecting means 108 fails in a line connection, "the next connection destination" will be required from the connection destination selecting means 111.

[0067]If "the next connection destination" is required, the connection destination selecting means 111 will resume retrieval processing, the following connection destination information 3, i.e., index number, to which it referred as the point, will try search of another connection destination

information on the same communications protocol, will discover the connection destination information on the index number 5, and will notify it to the line connecting means 108.

[0068]The line connecting means 108 tries a line connection again according to the connection destination telephone number and protocol type which were notified.

[0069]If the line connecting means 108 fails also in the line connection to this connection destination telephone number, it will require "the next connection destination" from the connection destination selecting means 111 again.

[0070]Although the connection destination selecting means 111 resumes retrieval processing, the following connection destination information 6, i.e., index, which searched like the point, Since the connection destination information applicable to the connection destination memory measure 110 cannot be discovered, search is again started from the index number 1 now, the next protocol type, i.e., a "PDC line switching", of a priority of an available protocol type, and the connection destination information on the index number 3 is discovered.

[0071]It searches like the following and a line connection is tried one by one by the applicable connection destination.

[0072]The connection destination selecting means 111 notifies "search failure" to the line connecting means 108, when it refers to the lowest-priority protocol type and search results cannot be obtained.

[0073]In this case, the line connecting means 108 notifies "connection failure" to the communication application 101 via the command interpret means 107 and port I/F105.

[0074]Thus, even if it is a case where the kind of telephone to connect is changed, and a case where the telephone which can use two or more communications protocols is connected according to this embodiment, It is not necessary to change the connections set of an information processor, and since a connection destination can be automatically determined according to the priority which the user etc. decided beforehand, the radio communications system which does not need the change operating of a connection destination is realizable.

## **DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1]The block diagram showing the composition of the radio communications system in connection with the embodiment of the invention 1

[Drawing 2]The explanatory view showing an example of the connection destination information in connection with the embodiment of the invention 1

[Drawing 3]The explanatory view showing an example of the AT command specification in connection with the embodiment of the invention 1

[Drawing 4]The explanatory view showing an example of the connection destination registration command in connection with the embodiment of the invention 1

[Drawing 5]The explanatory view showing an example of the connection destination information memorized by the communication control unit in connection with the embodiment of the

invention 1

[Drawing 6]The explanatory view showing an example of the protocol priority registration command in connection with the embodiment of the invention 1

[Drawing 7]The explanatory view showing an example of connection of the connecting cable in connection with the embodiment of the invention 1

[Drawing 8]The explanatory view showing an example of the sequence of the protocol recognition processing in connection with the embodiment of the invention 1

[Drawing 9]The block diagram showing the composition of the conventional radio communications system

[Description of Notations]

100 Information processor

101 Communication application

102 Connections set

103 Connection destination registration means

104 Priority registration means

105 Port I/F

106 Communication control unit

107 Command interpret means

108 Line connecting means

109 Connecting means

110 Connection destination memory measure

111 Connection destination selecting means

112 Protocol recognition means

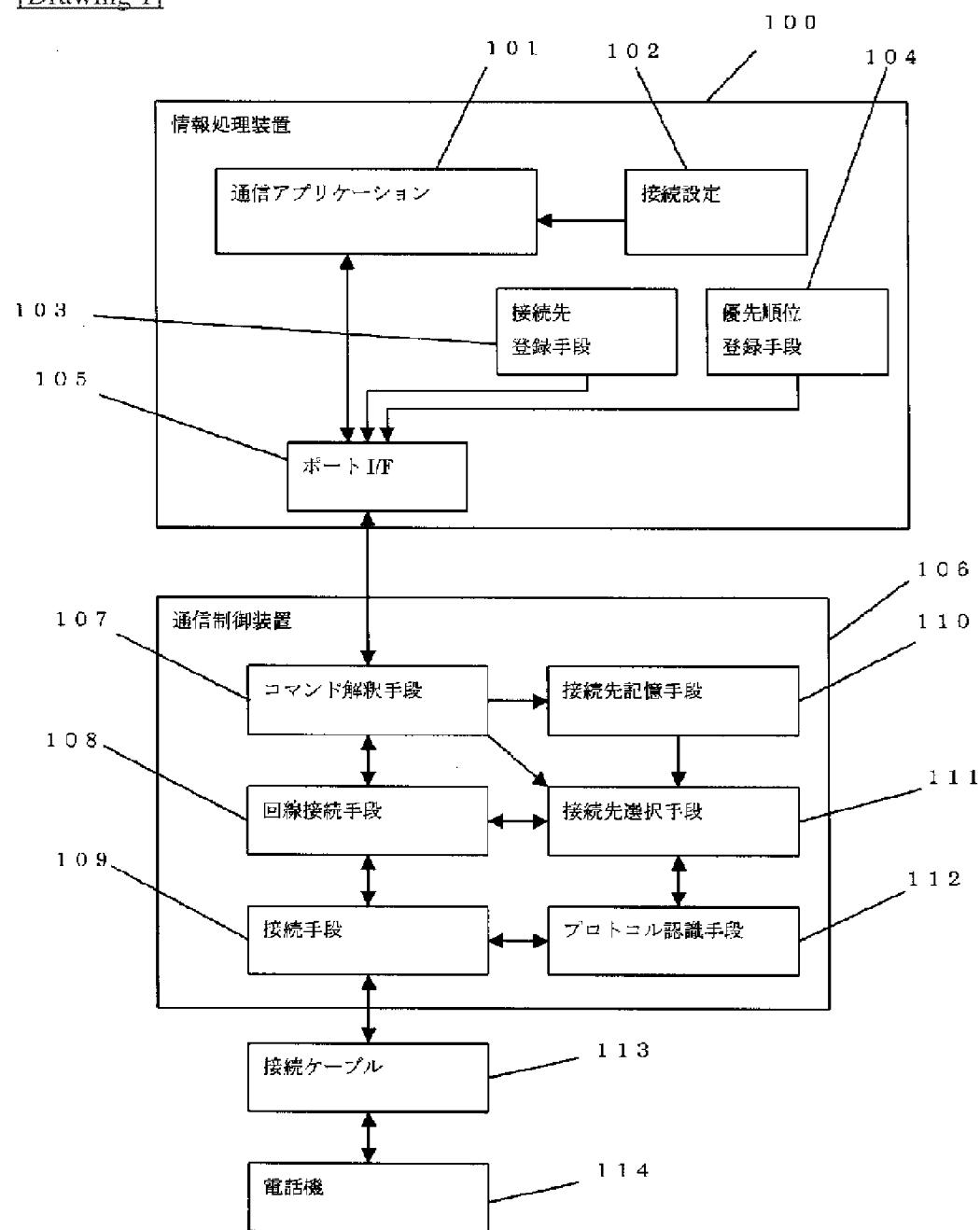
113 Connecting cable

114 Telephone

## DRAWINGS

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[Drawing 1]



[Drawing 2]

接続先電話番号	プロトコル種別
123-1111-1111	PIAFS 64Kbps
123-2222-2222	PIAFS 32Kbps
123-3333-3333	PDC 回線交換
123-4444-4444	PDC パケット
123-5555-5555	PIAFS 32Kbps
123-6666-6666	PDC 回線交換
123-7777-7777	PDC パケット

### [Drawing 4]

```
AT+XN1=123-1111-1111:PIAFS64  
AT+XN2=123-2222-2222:PIAFS32  
AT+XN3=123-3333-3333:DATA  
AT+XN4=123-4444-4444:PACKET  
AT+XN5=123-5555-5555:PIAFS32  
AT+XN6=123-6666-6666:DATA  
AT+XN7=123-7777-7777:PACKET
```

### [Drawing 3]

AT+XNn=[電話番号]:[プロトコル種別]

nは1~20

プロトコル種別は、「PIAFS32」、「PIAFS64」、「DATA」、「PACKET」のいずれかの文字列

上記文字列とプロトコル種別の対応は以下の通り

プロトコル種別	文字列
PIAFS 64Kbps	PIAFS64
PIAFS 32Kbps	PIAFS32
PDC 回線交換	DATA
PDC パケット	PACKET

(a)

AT+XP=[プロトコル種別]:[プロトコル種別]:[プロトコル種別]:[プロトコル種別]

プロトコル種別は、「PIAFS32」、「PIAFS64」、「DATA」、「PACKET」のいずれかの文字列

優先順位の高いプロトコル種別から順次指定する。

上記文字列とプロトコル種別の対応は以下の通り

プロトコル種別	文字列
PIAFS 64Kbps	PIAFS64
PIAFS 32Kbps	PIAFS32
PDC 回線交換	DATA
PDC パケット	PACKET

(b)

ATD[電話番号]

ただし、電話番号として「#\*\*\*」が指定された場合は接続先選択手段による自動接続とする。

(c)

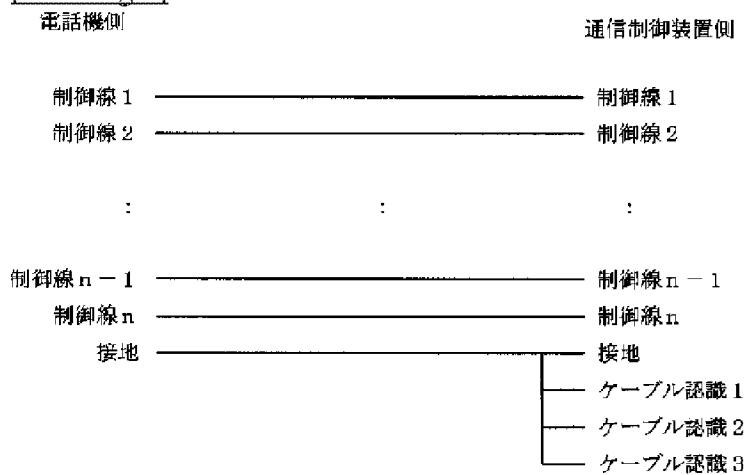
### [Drawing 5]

インデックス	プロトコル種別	接続先電話番号
1	PIAFS 64Kbps	123-1111-1111
2	PIAFS 32Kbps	123-2222-2222
3	PDC 回線交換	123-3333-3333
4	PDC パケット	123-4444-4444
5	PIAFS 32Kbps	123-5555-5555
6	PDC 回線交換	123-6666-6666
7	PDC パケット	123-7777-7777

[Drawing 6]

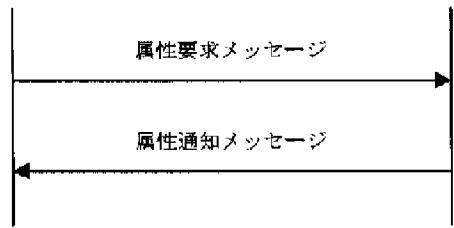
```
AT+XP=PIAFS64:PIAFS32:PACKET:DATA
```

[Drawing 7]



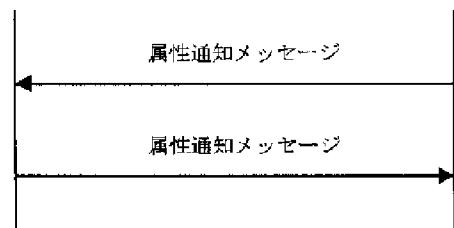
[Drawing 8]

通信制御装置 電話器



(a)

通信制御装置 電話器



(b)

[Drawing 9]

